Routledge
Taylor & Francis Group

The Design Journal
An International Journal for All Aspects of Design

ISSN: 1460-6925 (Print) 1756-3062 (Online) Journal homepage: https://www.tandfonline.com/loi/rfdj20

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To cite this article: Francesca Ostuzzi, Lieven De Couvreur, Jan Detand & Jelle Saldien (2017) From Design for One to Open-ended Design. Experiments on understanding how to open-up contextual design solutions, The Design Journal, 20:sup1, S3873-S3883, DOI: 10.1080/14606925.2017.1352890

To link to this article: https://doi.org/10.1080/14606925.2017.1352890

Published online: 06 Sep 2017.

DESIGN FOR NEXT
EAD12-ROME

doi: 10.1080/14606925.2017.1352890

Design for Next

12th EAD Conference
Sapienza University of Rome
12-14 April 2017

From Design for One to Open-ended Design.
Experiments on understanding how to open-up contextual design solutions.

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Abstract: Online platforms (i.e. Instructables) often provide design solutions developed locally for one specific person's needs. The goal of the research is to understand how existing specific projects, created to be *for one* person, can be translated into *open design* solutions that facilitate spontaneous re-appropriation in a variety of new contexts. By observing and interviewing 36 teams of students within a living lab project where occupational therapists and designers co-design personal assistive devices with and for disabled clients, we explored how the relevant design information can be meaningfully reorganized to create *open design*. We focused on the designers' choices of concrete attributes with a high impact on the end-result. We suggest a model wherein these attributes are listed and categorized as: Undefined, Defined-Fixed, Contextual, balancing openness and over-design. The research led to a new definition that distinguishes "Open-ended Design" from "Open Design".

Keywords: Open Design, Open-ended Design, Re-appropriation, Imperfection, Product Design

1. Introduction

Nowadays online platforms (i.e. Instructables, Thingiverse, etc.) often provide design solutions developed for one specific person, in order to solve her/his specific needs. These solutions are created using different approaches and technologies; from more traditional DIY (Do It Yourself) and hacking solutions to digitally fabricated ones. The developer decides to share the solution with online communities, believing in its potential value for other stakeholders.
Some of these projects are picked-up by the community, stimulating a conversation and sometimes being reproduced in other contexts. Occasionally, the picked-up solutions are even distributed back to the online community in their often adapted and implemented version. We define this process as *re-appropriation* (Ostuzzi, Conradie, Couvreur, Detand, & Saldien, 2016)(Redström, 2008)**.** In this transformative process the user modifies some features of designed solution in order to make it more fitting to his/her context. The kind of products where such re-appropriation is important, and

even necessary, are here defined as *contextual* to highlight the crucial role played by the context of use and the inappropriateness of transferring them "as they are" to other contexts. When enough re-appropriations cycles happen the creation of very interesting open design solutions might be achieved (see Fig.1a and b). One example of this dynamic is represented by 'Enabling the Future' (enablingthefuture.org) a 3D printed prosthetic hand that from being the *contextual* solution for one child, became a parametric design available for all. This started with all the people who shared their variations and implementations of the same product and continued with the effort of translating all the obtained data into information useful for the community, in this case in form of a guide on how to build the prosthetic hand according to specific dimensions of the child's forearm (Fig. 1). Such a dynamic intrinsically refers to communities that share a common need, but that are too much diverse (a sort of *inner diversity* of the community) in order to be satisfied by a *standard* solution.

After all, this dynamic process occurs also offline, in the design-after-design sphere and can be defined as "defining use through use" (Redström, 2008) this happens for products that are not open and not digital. What is important to notice is that in both cases (online and offline) the re-appropriation cycles occur more easily with certain solutions than others, as we know thanks to experience in the field and observations.

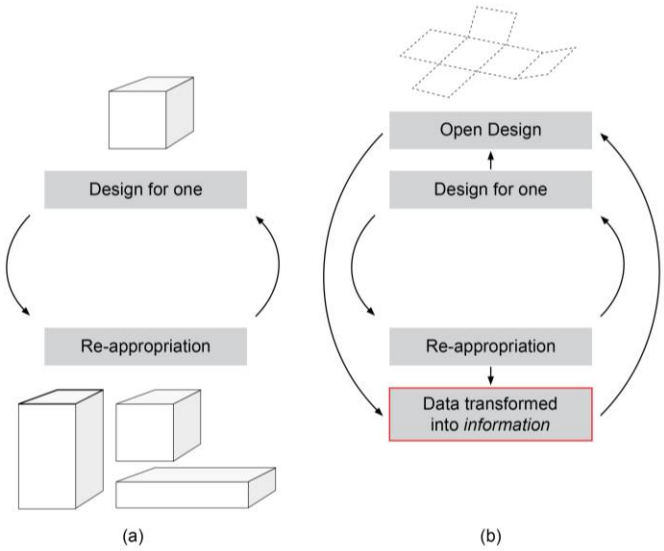

Figure 1: (a) Re-appropriation cycles (b) leading to Open Design Solutions. Highlighted in red the focus of the presented research discussed in this paper.

While some studies focused on the digital manufacturing field (Hermans, 2014)(Ostuzzi, Rognoli, Saldien, & Levi, 2015), little has been done (Dalton, Desjardins, & Wakkary, 2014) in understanding how to facilitate, by design, the re-appropriation of low tech and highly contextual hardware solutions from different, unknown, unpredictable but yet connected stakeholders. As understandable, the main problems are related to the ability of anticipation (1), during the design and communication phases, of future possible needs of the potential users (Poli, 2009) (Zamenopoulos & Alexiou, 2005) and the translation (2) of this knowledge into actual design features or design instructions (Yen, Flinn, Sommerich, Lavender, & Sanders, 2013).

1.1 Aim

The goal of the presented research is therefore to understand how to support the translation of existing projects, created to be for one person, into open design solutions, with the relevant design information meaningfully reorganized. By bridging the existing gap between the context of design and the context of use (Hermans, 2014)**,** we aim at facilitating stakeholders to transform useful existing solutions in the most fitting configuration for them. Herein, we will present only the first

step of the whole process, highlighted in red in Fig. 1b. This means that we will not discuss: the first design process adopted to achieve the solution *for one* and the translation of these information into actual design strategies (industrial and post-industrial). The communication of the obtained information into the real context of use will be just briefly introduced.

2. Small reference to main foundations

In this section we overview some important aspects related to the presented dynamic of opening-up contextual solutions. Specifically, we briefly introduce the role of product adaptations, the role of imperfection and the importance of the communication.

2.1 Products Adaptations

In this research we focus on communities who share a problem where highly differentiated solutions are needed for each person. A typical example of product category is represented by assistive technology, meant for communities facing disablements while conducting daily activities. In such contexts the possibility to adapt the product is not only important, but sometimes fundamental for the functioning of the solution itself. Our attention is therefore focused on how to understand which are the essential variables of the system, and which are the aspects that can remain the same and be useful for the addressed community. In this sense a well-designed set of information and solutions can become a tool to empower the end user to achieve the optimal solution for his/her specific context, through products adaptations (Redström, 2008).

2.2 Instructions and Imperfection

Studies explored the relation between the presentation of tutorials/instructions (i.e. DIY ones) and the ease of making the products themselves, implying changes in the amount of information, structuring of the information, the overall formatting of the communication and in the authorship (Dalton et al., 2014) (Wakkary et al., 2015) (Dahl & Moreau, 2007). Often, it is highlighted as some instructions (i.e. the material listing) are incomplete and some relevant information is missing. Furthermore, it is always a basic assumption that the end result should be a copy of the proposed one. In this line, the study of (Dahl & Moreau, 2007) gives interesting insights about to which extend should the outcome of a creative task be dictated. The study shows, that it is not the definition of the goal of the task in terms of “make this exact result” or “make any result” that drove the participants’ enjoyment of the task. More important is the experience of a balanced relation between autonomy and competence. With the end-users being experts of their own experience (Sanders & Stappers, 2008)**,** they switch from *copying* something, to fully co-designing it (again, following a re-appropriation cycle), using as a starting point of existing examples and/or guidelines.

In this case, it appears clear that some of the design instances shared with a broader public should be under-designed in order to leave flexibility and openness to the user to re-appropriate them as needed. The concept is not new to literature, and can be related with concepts as ambiguity and imperfection (Gaver, Beaver, & Benford, 2003)(cancelled for blind review). Both, ambiguity and imperfection can become a resource for creativity that deals with the loss of control from the designers’ side. Furthermore, both try to “make a virtue out of technical limitations” (Gaver et al., 2003). According to this view, the configuration and meaning of the product raise (and reaches its complete development) from the context and not before. These imperfections are not meant with a prescriptive purpose, but work in suggesting and facilitating possible scenarios.

At this stage of the research we explored the role of the main building blocks of the products: the attributes. Product’s attributes can be hard or soft, depending on their physical or more of meaning role. The relation between the products’ attributed, the openness in design and models to support designers can be seen in (Hermans, 2015)(Blijlevens, Creusen, & Schoormans, 2009)(Johnson, Lenau,

& Ashby, 2003). These attributes can change in order to obtain high customization, or personalization of products with different levels of contribution from the user (Sinclair, 2006), they can change in a discreet or continuous way, they can change in a reversible way, they can change in different moment (be defined during production, or after-design), intentionally or not, etc. What is important is that by identifying and changing meaningfully products' attributes we can reach unique and more fitting version of the same family of products. With all this in mind we started our exploration about how to identify the relevant aspects of contextual solutions and how to organize them.

3. Methodology

For two academic years (A/A 2013/14 and 2014/15) we observed and interviewed 36 teams of design students of Design for Ever(one) (see: http://designforeveryone.howest.be; Couvreur & Goossens, 2011), a university course where a co-creation process of unique and personal assistive devices takes place. This course can be seen as meaningful example of co-creation of highly *contextual* and *for one* design solutions. Here, multidisciplinary teams (designers, occupation therapists and users) work together, communicating with prototypes, in order to find a solution for a specific problem encountered while developing a daily activity. The solution is meant for the only user involved in the process, and has to be in form of a functioning one-piece product.

In this research, at the end of the course, we challenged students with the question of opening-up their solutions, imagining the need of transferring the projects to other (in this case unknown) users and contexts of use. We asked them: What would happen to your project, if used by somebody else? What design attributes should remain the same? What could or should change? For all the analysed case studies the interest was focused on the fact that the resulting design attributes always started from un-conventional users or way of use, for which no standard solution could fit the approached scenario. Errors and imperfections led to new understanding of possible solutions, often obtained following a re-appropriation cycle in form of hacking strategy. The unexpected discoveries, emerged thanks to the co-generation phase, played as trigger in the design process and, being often actual obstructions and limitations, worked as creative challenge to be solved by students. In this framework of experimentation, errors and defects worked as meaningful elements, and unpredictable events were always highlighted (Couvreur, Dejonghe, Detand, & Goossens, 2013) as trigger for achieving meaningful changes in the design solution.

The research method adopted was practice based, qualitative and highly iterative, with the constant goal of understanding the students' choices in terms of design attributes (colours, dimensions, materials, etc.) and their relation with the context from where they emerged.

3.1 Process of the interviews

Both years (A/A 2014/15 and 2015/16) we followed the students during their entire design process of 1 semester. At the end of the year the physical product is delivered to the user, and we asked each team to bring an exploded view of their final result (on A3 paper format). These papers, and the recorded interview, represent our data. Firstly, the goal was to better understand the value of each solution and the reasons behind particular choices in terms of design attributes. Secondly the interview was focused on questions as "What would happen if another user uses this exact product? What attribute can remain exactly the same? What can or should change?".

This exercise was sometimes, especially at the beginning of this research, difficult both for students and researchers. For researchers it was hard to find the correct words “what can change, but shouldn’t change?” is deeply different from “what can change, and should change?”. This effort on finding the right words was iterative, and helped to facilitate the communication and to formalize different declinations of the design attributes with respect to the opening-up process. In fact, while at the beginning the focus was just on “what can change?” it appeared clear that this was not enough. On the other hand, the exercise was difficult for the students because sometimes it was clearly questioning the relevance of their choices, and therefore their role as designer and the crucial matter of losing control on your own creation: “if everything can change, where does my idea and contribution lay?”, “if something should change, who is going to define that?”, etc. For example, thanks to these evidences we understood the importance of asking them to define the *core* idea of the project, meaning the aspect without which the project would not be *their project* anymore. During the first year a basic model for the interview was created and then implemented during the second year and tested again. The interviews were done before creating the Instructables page where students shared their results. This helped them while reorganizing the information related with their projects, but no mandatory process had to be followed while creating the pages.

4. Results

In this section we present the developed model and 2 cases of application.

4.1 Selected cases and brief description

Only 2 of the 36 final design outcome will be reported here, these cases were selected in order to better illustrate the model, the contained definitions and its function.

Figure 2: The selected cases. From left to right: assistive device to play the recorder; seating assistive device.

Here following a brief description of the selected cases. All projects were needed because of absence of suitable alternatives in the market.

- **Assistive device to play the recorder** (design by: Kobejoren, C. Geldof, E. Quartier, S. Vanneste and J. Caes). This device is designed for a man passionate of playing the recorder, but who lost his left index finger. This tool gives also the possibility to play different recorders (alto- tenor- and bass- recorder).
- **Seating assistive device** (design by: Jan, J. Leirman, S. Vernimmen, L. Verhaeghe and L. Vanbiervliet). This chair is meant for a 3 years old child with cerebral palsy, and it is helping to keep him in the correct position. The chair is meant to be foldable, light and easy to be transported by his parents.

4.2 The obtained model and its application

The model addresses both hard and soft design attributes and its goal is to help designers rearranging the relevant information of their design, when sharing it with unknown contexts.

The demands contained in the model are here presented.

1. List all the components of your solution (the use of visual or physical representations is highly suggested, i.e. a physical/virtual prototype or an exploded view can be used, Fig. 3).
2. List all the components (or sub-assemblies) considered crucial to deliver the function. These *key elements* (or *core* ones) are the first to be analysed, sometimes the analysis can be considered concluded just analysing them.

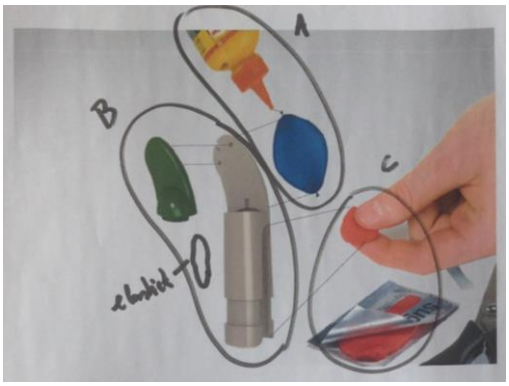

Figure 3: Students decided to use a graphical solution where the three main sub-assemblies A-B-C are highlighted.

3. Describe the hard attributes (architecture, shape, dimensions, proportions, aesthetics, connections, material properties and processing) in terms of *undefined, defined-fixed* and *contextual definition*.

- With *undefined* elements we refer to design choices that are not important for the solution itself, these elements shouldn't be communicated in order to avoid an information overload. This is the first aspect of open solutions: a possible under-load of the communicated project. For example, in the seating assistive device the back support is square-shaped just because that was easy to be made, this is then an undefined attribute. These undefined elements can be changed or not, with no implications on the functioning of the product.
- The *defined-fixed* elements are the ones considered fundamental for the functioning of the product itself. According to the interviewed students, any change in these elements can lead to malfunctioning or loss of the initial project identity. For example in the assistive device to play the recorder the main idea of the solution is in the material used to cover the hole (green in Fig. 2). Its precise properties allow the function, by changing it a completely the *core* knowledge of the project would be somehow lost, with a potential malfunctioning of the solution. Therefore, in this case the material properties are defined-fixed. These *designed-fixed* elements shouldn't be changed in the new context and it is important to communicate them in a precise and exhaustive way.
- The *contextual* elements are the real field where open solutions find their expression. We refer in this case to elements that need to change, in order to fit in the new context of use. For example, in the assistive device to play the recorder the shape, dimensions and proportions of the B component are based on the shape of the user's hand, this are therefore contextual variables. In this case the listed Attributes should change according to the user, in order to function properly. These *contextual* elements should also be communicated precisely, but in an open manner, for example not communicating any final dimensions, but the procedure needed to obtain them.

- Define the soft design attributes, starting from the function of the existing solution. Can the function change? Which means, if the solution can be used by the same person to solve other problems. For example: the Seating device is meant to be a transportable one, for short periods, but can be used at home or at school in the same way.
- Define the users' need. Can the need change? (For example: if the solution is meant for paralyzed persons, but also weak ones can find it useful, then the need can change). Again referring to the seating assistive device, being a light and easily foldable seat, the product can be used by other children, even without cerebral palsy.
- Define if the overall product is more contextual or fixed, and sketch future up-scaling scenarios according to this aspect and to a potential volume of users (mainly: how big is the panel and how diverse?). Motivate your ideas. For example: the device to play the recorder for a person with an amputation is has a potential low volume of users (highly specific need) and mainly contextual (inner diversity of the potential users).

Once all the possible design attributes are identified and classified, there are many steps that can be taken, depending on the situation. In this study we don't present any up-scaling process. We communicated all the projects to other stakeholders in form of instructions in Instructables.org (for the two presented cases see: "The flute assistance tool" and "FleXiseat"). We suggested to the students to base their instructions on this module and to try to find balance between open and undefined and over-design (Dahl & Moreau, 2007).

5. Discussion

This study focuses the attention on design solutions made for one person and the possibility of opening them up in order to facilitate re-appropriations cycles, meaning with this changes in their Attributes. These changes are important in situations where high variability between users can lead to malfunctioning or product failure. This need, which is clear for assistive technology, can have implications in terms of sustainability, personalization, emotional bond, value proposition, etc. also for other products categories.

The process of categorization of the design attributes (*contextual, undefined* or *defined-fixed*) sees the importance of a first iterative design cycle where a co-generative process is undertaken by all the relevant actors. Such a co-design process is similar to the one needed to approach customization/personalization solutions, but fundamental differences should be highlighted. Here there is no intention of defining beforehand the possible configurations (as, for example, a set of options) because their definition should raise from the context of use.

Finally, even if we recognize how these solutions can find their realization thanks the adoption of digital technologies typical of open design, we do believe that their openness shouldn't' be limited to that. In certain cases, for example the Seating Assistive device, the need is spread to the point of justifying high volume of production. We see possibilities of leaving *spaces of freedom* for the re-appropriation of the products (by changing the contextual attributes) even when adopting standard non-digital and high volume production techniques. This implies that the proposed solutions should be up-scaled by adopting design strategies where meaning imperfections in the design allow and even sustain design-after-design dynamics, after use re-appropriations, adaptations, etc.

5.1 New definition of Open-ended Design

For these reasons, a new definition is introduced which shifts from *open design solutions* to *open-ended design solutions*. An Open-ended Design (OeD) is seen as a project able to change, according to the changing context. Open-ended Design, can also be defined as suboptimal, error-friendly (Manzini, 2010), unfinished, Wabi Sabi (Juniper, 2011) contextual, context-dependent and is characterized by its inner flexibility due to the *voluntary* incomplete definition of its features, also defined as its Imperfection. Whilst this concept is grounded in software development (i.e. Wikipedia programming system is explicitly inspired by the Wabi Sabi approach), it is still harder to transfer it into hardware and low-tech solutions. In these solutions, the sub-optimality of the design itself might serve as trigger and facilitator for re-appropriation cycles. We use the term "voluntary" in this definition, which might be substituted also by conscious or intentional, to highlight how this research focuses on intentionally made open-ended design solutions. At the same time, we acknowledge as every object is, once put in the *real world* (from its own production to the end of life, and second life) open-ended per definition (becoming a *Ultimate Particulars*) (Nelson & Stolterman, 2012)(Stolterman, 2008), but in a non-intentional way, at least from the designer perspective. Another important term that should be highlighted is the "ability" to change, which underline the knowledge of how we can intentionally support potential (and unpredictable) changes, without forcing them. This definition gets close to the definition of opened design (Sinclair, 2006) "those whose original specification and/or design may be changed with direct consumer input", but while this refers to the NPD (New Product Development) we believe that open-ended design can only become manifest in time and in the final context of use. Furthermore, it can be applied as a learning method of non-intentional dynamics happened after-design. A final important clarification is that the whole research here presented is focused on how to create and support intentionally made open-ended solution, but acknowledges the possibility of Non Intentional Design (NID) re-appropriations cycles (Brandes 2006)(Wakkary & Maestri, 2008)(i.e. ernestooroza.com).

To achieve our results, we engaged into a *research through design*, based on constant co-generative processes. Many designers and users were involved into this explorative process. We started with no hypothesis and we tried to learn from our observations and interviews, using a highly iterative approach that led to the presented model, which we don't consider final. This participative aspect is a strength of our research, but also led to weaknesses related to complexity, non-replicability and difficulties of analysing all the data in univocal way. Another limitation of this study, which is intrinsic to it, is the limited presence of follow-ups and tests of our model. This is due to two main factors: the consistent need of resources in order to up-scale and replicate products and the need of time, in order for some changes to happen.

6. Conclusion and future works

This study reports on the first step of a bigger project that sees the creation of Open-Ended Design solutions as crucial for satisfying communities with shared, but yet diverse needs. Here, only the translation from *contextual* design (for one) into Open-ended Design was explored. First, thanks to an observational phase, different kind of design attributes were identified and defined as Products' Attributes, both hard and soft. Secondly, these Attributes were listed and characterized according to the need to remain Open-ended, which means intentionally undefined.

Finally, a model to support designers while *opening-up* their designed solution was created. The proposed model, which has not prescriptive nature, helps in identifying the relevant *contextual* design Attributes, meaning with this the attributes that *need* to be changed in the context of use, in

order for the product to function properly. The designer should therefore leave these attributes open and a reasonable balance, between undefined and defined, contextual and fixed elements, should be found. In this study we mainly answer the question "*What* could or should change, with the changing context?".

With this research we the advice to identify a *space of freedom* for the product in order to change thanks to the context of use. This freedom can be seen as an imperfection of the project but, as stated for Ambiguity (Gaver et al., 2003), this shouldn't be considered as an excuse for poor design. We suggest designing with *meaningful imperfections*, which means to achieve a deep understanding also by adopting co-creation processes and by engaging in attempts of anticipating where the Open-endedness should lay. The model can also give inspirations with regard of possible business model and up-scaling strategies, remaining within the Open-ended scenario.

Next studies will follow the up-scaling of the previously analysed projects. They will refer to possible mechanisms (also definable as *strategies*) to transfer such Open-endedness into commercial products, and not instructions. In this way future studies should focus on "*How* could these attributes change, with the changing context?".

References

Blijlevens, J., Creusen, M. E. H., & Schoormans, J. P. L. (2009). How Consumers Perceive Product Appearance: The Identification of Three Product Appearance Attributes. *International Journal of Design*, *3*(3), 27–35.

Couvreur, L. De, Dejonghe, W., Detand, J., & Goossens, R. (2013). The Role of Subjective Well-Being in Co-Designing Open-Design Assistive Devices. *International Journal of Design*, *7*(3), 57–70.

Couvreur, L. De, & Goossens, R. (2011). Design for (every) one : co-creation as a bridge between universal design and rehabilitation engineering. *CoDesign : International Journal of CoCreation in Design and the Arts*, *7*(April 2013), 107–121.

Dahl, D. W., & Moreau, C. P. (2007). Thinking Inside the Box: Why Consumers Enjoy Constrained Creative Experiences. *Journal of Marketing Research*, *44*(3), 357–369. http://doi.org/10.1509/jmkr.44.3.357

Dalton, M. A., Desjardins, A., & Wakkary, R. (2014). From DIY tutorials to DIY recipes. In *Proceedings of the extended abstracts of the 32nd annual ACM conference on Human factors in computing systems - CHI EA '14* (pp. 1405–1410). New York, New York, USA: ACM Press. http://doi.org/10.1145/2559206.2581238

Gaver, W. W., Beaver, J., & Benford, S. (2003). Ambiguity as a resource for design. *Proceedings of the Conference on Human Factors in Computing Systems - CHI '03*, (5), 233. http://doi.org/10.1145/642651.642653

Hermans, G. (2014). Investigating the Unexplored Possibilities of Digital – Physical Toolkits in Lay Design, *8*(2), 15–28.

Hermans, G. (2015). *Opening Up Design: Engaging the Layperson in the Design of Everyday Products*. Umea University.

Johnson, K. W., Lenau, T., & Ashby, M. F. (2003). The aesthetic and perceived attributes of products. *Iced 2003*.

Juniper, A. (2011). *Wabi Sabi: The Japanese Art of Impermanence*. Retrieved from https://books.google.com/books?id=objWAgAAQBAJ&pgis=1

Manzini, E. (2010). SMALL, LOCAL, OPEN, AND CONNECTED: Design for Social Innovation and Sustainability. *The Journal of Design Strategies - Change Design*, *4*(1).

Nelson, H. G., & Stolterman, E. (2012). *The design way: intentional change in an unpredictable world*. *MIT Press*. London.

Ostuzzi, F., Conradie, P., Couvreur, L. De, Detand, J., & Saldien, J. (2016). The Role of Re-

Appropriation in Open Design : A Case Study on How Openness in Higher Education for Industrial Design Engineering Can Trigger Global Discussions on the Theme of Urban Gardening, *17*(4).

Ostuzzi, F., Rognoli, V., Saldien, J., & Levi, M. (2015). +TUO project. Low Cost 3D printers as helpful tool for small communities with rheumatic diseases. *Rapid Prototyping Journal*, *21*(5), 491–505. http://doi.org/10.1108/RPJ-09-2014-0111

Poli, R. (2009). The complexity of anticipation. *Balkan Journal of Philosophy*, *1*(1), 19.

Redström, J. (2008). RE:Definitions of use. *Design Studies*, *29*(4), 410–423. http://doi.org/10.1016/j.destud.2008.05.001

Sanders, E. B.-N., & Stappers, P. J. (2008). Co-creation and the new landscapes of design. *CoDesign*, *4*(1), 5–18. http://doi.org/10.1080/15710880701875068

Sinclair, M. (2006). A Classification of Consumer Involvement in New Product Development The New Product Development (NPD) Process.

Stolterman, E. (2008). The nature of design practice and implications for interaction design research. *International Journal of Design*, *2*(1), 55–65. http://doi.org/10.1016/j.phymed.2007.09.005

Wakkary, R., & Maestri, L. (2008). Aspects of Everyday Design: Resourcefulness, Adaptation, and Emergence. *International Journal of Human-Computer Interaction*, *24*(5), 478–491. http://doi.org/10.1080/10447310802142276

Wakkary, R., Schilling, M. L., Dalton, M. a., Hauser, S., Desjardins, A., Zhang, X., & Lin, H. W. J. (2015). Tutorial Authorship and Hybrid Designers. *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems - CHI '15*, (April), 609–618. http://doi.org/10.1145/2702123.2702550

Yen, W.-T., Flinn, S. R., Sommerich, C. M., Lavender, S. a, & Sanders, E. B.-N. (2013). Preference of lid design characteristics by older adults with limited hand function. *Journal of Hand Therapy : Official Journal of the American Society of Hand Therapists*, *26*(3), 261–70; quiz 271. http://doi.org/10.1016/j.jht.2013.04.002

Zamenopoulos, T., & Alexiou, K. (2005). Design and anticipation: towards an organisational view of design systems. *Paper Presented at the Proceedings of the ECCS 2005 Satellite Workshop: Embracing Complexity in Design*, *44*(0). http://doi.org/10.1.1.126.4785

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Jan Detand His field of research is situated in the domain of industrial design engineering. The research group of industrial design engineering (IDE) is an open research community that focuses on transdisciplinar research through design. IDE utilizes design skills such as design thinking, creativity and prototyping to interact with different stakeholders involved in the transdisciplinary research.

Jelle Saldien Assitant Professor Industrial Design at Ghent University and steering member of Flanders Make VD4. Jelle Saldien is author of over 40 technical publications, proceedings, editorials and books. His research interests include mechatronic design, interaction design, human computer interaction and social robotics.